
PROPULSION DIRECTORATE

Monthly Accomplishment Report October 2004



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INTEGRATED POWERHEAD DEMO POISED TO BEGIN TESTING: The Propulsion Directorate recently completed Engine System Installation and Initiated Activation for the Integrated Powerhead Demonstration (IPD). All major and minor system components of the IPD demonstrator engine have now been completed, and facility activation checkout is complete. The IPD engine assembly was successfully rotated from assembly configuration and moved to the E1 Cell 1 test stand at [NASA Stennis Space Center](#), Mississippi. The next major IPD program milestone is engine system testing initiation, which is scheduled to commence in February 2005. The IPD Program addresses the DoD, NASA, and commercial needs to operate a highly reliable and long life rocket engine system with significantly reduced operational costs. Through the utilization of a full flow staged combustion cycle, the IPD engine can achieve life and reliability 10 times greater than the Space Shuttle Main Engine. The technology embodied in the IPD engine components can be used for both long life reusable systems and highly reliable low cost expendable rocket engines. (Mr. S. Hanna, AFRL/PRSE, (661) 275-6021)



The Integrated Powerhead Demonstration demonstrator engine being installed for testing at NASA Stennis Space Center

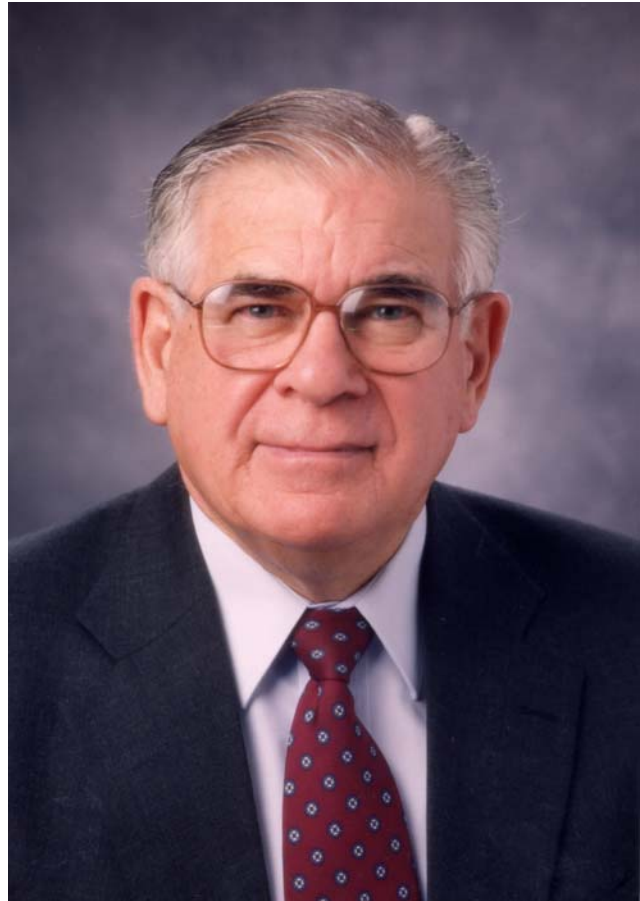
STUDY CONTRIBUTES TO FORMULATION OF SPACE STRATEGY: Researchers in the Propulsion Directorate recently completed the first phase of their Aerospace Propulsion Technology Screening Study (APTSS). Phase 1 of the APTSS provided an up-to-date assessment of rocket, scramjet, turbine-based combined cycle (TBCC), and rocket-based combined cycle (RBCC) engine technologies for access-to-space missions. Information generated under this study has been transitioned to both the DoD-NASA Horizontal Takeoff and Horizontal Landing (HTOHL) study and the AFRL Responsive Space Advanced Technology Study (RSATS). In addition, this information is being used to support the National Aerospace Initiative, to help formulate a Space S&T



A conceptual high speed flight vehicle

Strategy, and to prepare materials for the periodic Space S&T Summits. Subsequent phases of the APTSS will expand the scope to include atmospheric cruise missions. (Dr. D. Eklund, AFRL/PRA, (937) 255-0632)

DR. CURRAN NAMED AFIT DISTINGUISHED ALUMNUS: Dr. Edward T. (Tom) Curran was named a Distinguished Alumnus of the [Air Force Institute of Technology \(AFIT\)](#) at a banquet held on 29 October 2004. The title of Distinguished Alumnus is the highest honor that AFIT bestows on a graduate, and it is meant to recognize those who have made significant contributions to the nation and exemplify AFIT's ideals. Dr. Curran received his PhD in Aerospace Engineering and Physics from AFIT in 1979, and he now joins a small group of AFIT alumni who have received this honor. Dr. Curran had a long and fruitful relationship with the Propulsion Directorate commencing in 1961, and eventually rose to the key positions of Chief Scientist and then Director. Early in his tenure with PR, Dr. Curran was awarded a joint patent for his foundational work on the supersonic combustion ramjet (i.e., scramjet) engine, and this work forms the basis for much of the hypersonic propulsion work being done today. He retired as PR's Director in 1997, but still remains active in the propulsion community. Earlier this year, Dr. Curran also received the prestigious American Institute of Aeronautics and Astronautics (AIAA) Air Breathing Propulsion Award. (Col M. Heil, AFRL/PR, (937) 255-2520)



Dr. Edward T. Curran was recently named a Distinguished Alumnus of the Air Force Institute of Technology

Want more information?

- ❖ An article on this award was published in the 5 November 2004 edition of the *WPAFB Skywrighter*,* which is also available on-line by clicking [here](#).

TEST STAND 2A NOW OPERATIONAL: A Propulsion Directorate team recently completed facility activation activities for Test Stand 2A at Edwards AFB, California. As a result, Test Stand 2A is now an operational test stand. The team successfully conducted a liquid nitrogen (LN2) blow down on the liquid oxygen (LOX) system and demonstrated cryo fill, transfer, and chill down operations (using LN2) on the LOX Storage Tank, LOX Run Tank, and LOX Run

* Curry, Kim, "AFIT Honors 2004 Distinguished Alumni," *WPAFB Skywrighter*, Vol. 45, No. 43, November 5, 2004, p. 3A.



Test Stand 2A at Edwards AFB is now operational

Line. The team also successfully performed a LN2 blow down through the LOX Run Line and special test equipment (STE) piping. Originally designed and built in the early 1960s, Test Stand 2A recently underwent a major [modernization effort](#). The testing of next-generation rocket engine components on Test Stand 2A is intended to provide more reliable, lower-cost, and higher-performance rocket engines for future systems. Notably, Test Stand 2A is the only DoD test stand capable of

performing full-scale rocket thrust chamber development testing in the 750,000 lb_f thrust class. (Ms. J. Carlile, AFRL/PRSO, (661) 275-5098)



Dr. William Copenhaver was selected to receive the Meritorious Civilian Service Award

DR. COPENHAVER HONORED FOR RESEARCH LEADERSHIP:

The Propulsion Directorate's Dr. William W. Copenhaver was recently selected to receive the Meritorious Civilian Service Award in recognition of his distinguished performance from June 1991 to July 2004. This award recognizes Dr. Copenhaver for his leadership and technical excellence as Compressor Technology Lead and Principal Scientist for the PR's Turbine Engine Division (AFRL/PRT). As the leader of the largest in-house compressor research program within DoD, his team doubled in size during his tenure and now operates the Compressor Aero Research Lab (CARL), a unique world-class facility for research on high-speed turbine compressors. Dr. Copenhaver currently serves as Principal Scientist for AFRL/PRT and he is the lead for the Versatile Affordable Advanced Turbine Engines (VAATE) Program's High Impact Technology (HIT) Pervasive Panel. The HIT panel is

responsible for exploring far reaching advances in technology for turbine engines to be developed through 2015 and beyond. Dr. Copenhaver has also generated a complete accounting of the Turbine Engine Research Complex's (TERC) facility assets, and he created a 10-year plan for future needs. As a result of his efforts, the division now has the most detailed planning document ever to guide key in-house R&D efforts. Dr. Copenhaver's technical expertise is both nationally and internationally recognized, and he has frequently represented AFRL as a world leader in high speed fan and compressor aerodynamics. (Mr. W. Koop, AFRL/PRT, (937) 255-4100)

DR. POLANKA HONORED FOR ADVANCING TURBINE TESTING: The Propulsion Directorate's Dr. Marc Polanka was recently selected to receive the Meritorious Civilian Service Award in recognition of his distinguished performance from March 2001 to July 2004. Dr. Polanka was recognized for his service as Technology Leader for the Turbine Research Facility (TRF) and Acting Director of the Turbine Engine Research Center (TERC). During this period, Dr. Polanka provided superior technical leadership in planning the operations and research for R&D programs in the TERC. These programs addressed the national program goals of the Integrated High Performance Turbine Engine Technology (IHPTET) and Versatile Affordable Advanced Turbine Engines (VAATE) technology programs, the F110 Engine Fan Improvement Program, and the JSF136 Fan Improvement Program. Dr. Polanka's team provided comprehensive research and development support and analysis for the most advanced turbine technology in the world. Under his leadership, facility capabilities were increased and revolutionary new measurement capabilities and techniques were developed to enable the Air Force to meet IHPTET and VAATE goals. Through Dr. Polanka's personal commitment, the Turbine Research Facility has become a nationally recognized research asset. (Mr. C. Stevens, AFRL/PRTT, (937) 255-4830)



Dr. Marc Polanka was selected to receive the Meritorious Civilian Service Award

MR. BROMAGHIM RECOGNIZED FOR ADVANCING ELECTRIC PROPULSION: The Propulsion Directorate's Mr. Daron R. Bromaghim was recently selected to receive the Exemplary Civilian Service Award in recognition of his distinguished performance from January 2002 to July 2004. Mr. Bromaghim was recognized for his efforts as a Program Manager in PR's Spacecraft Branch (AFRL/PRSS) at Edwards AFB, California. Mr. Bromaghim has had a hand

in virtually all of the high-profile electric propulsion programs managed by the Spacecraft Branch. His involvement has ranged from in-house test programs to high value contracted efforts to cross-agency efforts to demonstrate electric propulsion on actual satellites. He has demonstrated extraordinary resourcefulness and leadership, which has resulted in advances in electric propulsion research and development. His leadership role in developing new electric propulsion components and engines and in demonstrating new electric propulsion concepts has contributed significantly to providing future warfighters with mission-enabling spacecraft propulsion technology. (Dr. F. Gulczinski, AFRL/PRSS, (661) 275-5528)



Mr. Daron Bromaghim was selected to receive the Exemplary Civilian Service Award

PR EQUIPMENT SUPPORTS LOCAL SCHOOLS:

The Propulsion Directorate recently completed the delivery of \$120K worth of new physical science laboratory equipment to five high schools in the vicinity of Edwards AFB, California. The equipment was delivered under an Educational Partnership Agreement (EPA) that PR has with the Antelope Valley Union High School District. The equipment loan, which consists of 131 separate line items, provides teachers in the district with a broad range of devices designed to increase students' enthusiasm for high school physics and chemistry, while also providing experimental tools for understanding scientific first principles. The equipment loan is part of a broader effort whose goal is to increase the number of students pursuing science and engineering careers. (Mr. R. Drake, AFRL/PRS, (661) 275-5542)



Antelope Valley High School students experiment with PR provided equipment

DR. BARNES ELECTED TO BOARD OF INTERNATIONAL COMMISSION: The Propulsion Directorate's Dr. Paul N. Barnes was unanimously elected to serve on the board for the International Cryogenic Materials Commission (ICMC) for a 6-year term from 2005 to 2011. The ICMC is a 30-year old organization that furthers the development of cryogenic materials. The purposes of the ICMC are accomplished through: (1) holding or sponsoring international conferences for the interchange of scientific and technical information; (2) publishing the proceedings of the International Cryogenic Materials Conference; (3) encouraging meritorious contributions to applied cryogenic materials science and engineering by means of awards and honors; and (4) coordinating with other organizations to enhance technical education and development of future cryogenic materials researchers. These activities are important for supporting the ongoing high temperature superconducting (HTS) wire research and development efforts in the Air Force and Navy. HTS wire will be used for compact power generators and electric motor drives important for directed energy weapons and ship propulsion systems. (Dr. P. Barnes, AFRL/PRPG, (937) 255-4410)



Dr. Paul Barnes was elected to serve on the board for the International Cryogenic Materials Commission